Children's Lifestyle Intervention Program (CLIP)
A community lifestyle intervention pilot program improves health status of sixth graders at risk for diabetes.

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ABSTRACT

Objective

To evaluate the impact of a lifestyle intervention program on the healthcare status of sixth grade students in a rural community setting. While reducing diabetes risk was the initial focus, it was recognized that lifestyle changes can have broader impact on healthcare status.

Design

The Children's Lifestyle Intervention Program attempts to answer the basic question: Does a community based lifestyle education program improve healthcare status in a group of children at increased risk for diabetes? Because of the essential role of parents in lifestyle habits, a secondary study question was adopted. Does the knowledge and perception of parents of children at increased risk for diabetes change when the children are enrolled in an education program? The sixth grade of two local schools in East Texas would each serve as experimental and control groups. Both groups would be screened for potential increased risk of diabetes. A subset of high risk students would be selected from each group. The experimental group and its subset would participate in a lifestyle intervention program emphasizing nutrition and activity. The control group and its subset would not participate in the intervention. Both groups and subsets would be screened after the intervention to evaluate for significant differences.

Subjects

The study focuses on sixth grade students in two different schools. The Lufkin experimental group consisted of 467 students with a high risk subset of 46. The Livingston control group consisted of 246 students with a high risk subset of 36.

Statistical Analysis

Statistical analysis was done comparing the experimental group and the control group. The data was analyzed through a 2-way analysis of variance that compared post-test scores between schools, while controlling for pre-test values.

Additional analysis compared pre intervention to post intervention data within each school. The data was analyzed through a nonparametric Wilcoxon related-samples t-test that compared pre-test and post-test values of the two schools. It was not assumed that data are normally distributed. It was also not assumed that variances and the means are equal for pre and post values.

In both analyses, statistically significant results were demonstrated.

Results

Experimental Group Compared to Control Group

Waist size decreased by 2 centimeters in the experimental group.
Fasting glucose decreased by 16 points in the experimental group.
Insulin levels decreased 7 points in the experimental group.
Triglycerides decreased 25 points in the experimental group.
HDL cholesterol increased by 8 points in the experimental group.
LDL cholesterol showed no change.
Total cholesterol increased by 5 points in the experimental group.
There was no statistically significant difference demonstrated in BMI or blood pressure.

Pre-Intervention Data Compared to Post-Intervention Data
There was a significant difference (P<=0.05) within the Lufkin boys for height, weight, waist, FBS, HDL, triglycerides and insulin; within the girls height, weight, waist, BMI, HgA1c, HDL, AST and ALT were significant. For the Livingston boys, there was a significant difference in height, weight, waist, BMI, HgA1c, total cholesterol, HDL, LDL, ALT and insulin, for the girls, height, weight, BMI, FBS, HgA1c, total cholesterol, ALT and insulin. For the high-risk Lufkin boys, there was a significant difference in height, FBS, HDL, triglycerides and insulin, for the girls in height, weight, waist, HgA1c, HDL, AST and ALT. For the high-risk Livingston boys, there was significance in weight, waist, HgA1c, total cholesterol, HDL, LDL, ALT and insulin, for the girls weight, BMI, FBS, HgA1c, total cholesterol, ALT and insulin were significant. There was a significant difference in blood pressure for both Lufkin boys and girls for both systolic and diastolic. There was a significant difference in blood pressure for Livingston boys for systolic; for girls, both systolic and diastolic were significant. There was a significant difference in blood pressure for the high-risk boys and girls in both schools.

Conclusions
When sixth grade children are presented with healthy lifestyle options in a fun format, it is possible to improve their health status. By connecting lifestyle choices with overall health, it may be possible to harness natural motivations in children to change behaviors and improve health status. While parents play an essential role in the health of their children, it is possible to achieve success with school programs that primarily target children. Community resources including hospitals, schools, and private interests might be an effective partnership in building a model that benefits their common interests – the children of the community.

In 2007, the Texas Legislature passed House Bill 3735 naming Memorial Health System of East Texas to conduct a pilot study that addresses the prevention and treatment of diabetes in their service area.

House Bill 3735 Summary
HB 3735 authorizes the Department of State Health Services and the Texas Diabetes Council to create a diabetes pilot program at Memorial Health System of East Texas that would provide a comprehensive approach to promoting the prevention and treatment of diabetes and acanthosis nigricans. The pilot program would:

- focus on an epidemiological approach to disease surveillance;
- identify the prevalence of acanthosis nigricans and diabetes in Memorial Health System's service area;
- provide health and wellness information to people positively screened for diabetes and acanthosis nigricans ;
- improve access to care for people diagnosed with diabetes and acanthosis nigricans ; and
- study the cost savings of early detection and treatment of diabetes and acanthosis nigricans.

The Memorial Health System could solicit, accept, and administer gifts and grants for the purpose of the pilot. The bill specifically would prevent funding the pilot project with state funds. Memorial Health System would be required to submit a report describing the effectiveness of the pilot program and recommendations for continuation of the program to the Texas Diabetes Council by October 1, 2008. This pilot program would expire September 1, 2009.

Children's Lifestyle Intervention Program (CLIP)
A team of physicians and diabetes educators was assembled to develop and implement this study. Given the broad wording in HB 3735, the team chose to narrow the focus to children, recognizing this as the greatest opportunity to make a meaningful contribution. While reducing diabetes risk was the initial focus, it was recognized that lifestyle changes can have broader impact on healthcare status. The prevalence of childhood obesity and its associated complications is well documented. [1 2 3 4 5]

The Children's Lifestyle Intervention Program attempts to answer the basic question: Does a community based lifestyle education program improve healthcare status in a group of children at increased risk for diabetes?

Due to the essential role of parents in lifestyle habits, a secondary study question was adopted. Does the knowledge and perception of parents of children at increased risk for diabetes change when the children are enrolled in an education program?

METHODS

Study Population

Two local schools, Lufkin Middle School and Livingston Junior High School were asked to participate in the study. In an effort to be sensitive to students who might be self-conscious about weight status, it was decided to implement the intervention program for all students and not just those identified to be at high risk. Sixth graders were chosen because it was believed that they were young enough to maximize the health benefit of lifestyle changes and yet old enough that they were beginning to make many of their own lifestyle choices.

The sixth grade of each school served as experimental and control groups. Both groups were screened to establish a baseline of anthropometric and health status data and to identify a subset of students who might be at increased risk for diabetes. A subset of high risk students was selected from each group. The experimental group and its subset would participate in a lifestyle intervention program emphasizing nutrition and activity. The control group and its subset would not receive the intervention. Both groups and subsets were screened after the intervention.

Lufkin students served as the experimental group. Data was collected on 545 Lufkin students. Seventy-seven students were missing pre or post data and were eliminated from the group. Height of one student was several inches less in the post screening than in the pre screening and was eliminated. After these eliminations, the Lufkin experimental group consisted of 467 students.

Livingston students served as the control group. Data was collected on 304 Livingston students. Fifty-eight students were missing pre or post data and were eliminated from the group. After these eliminations, the Livingston control group consisted of 246 students.

Health Screening

Screening criteria included: height, weight, waist circumference, family history (defined as parent, grandparent or sibling), presence or absence of acanthosis nigricans (AN) (only the nape of the neck was screened), and blood pressure. Body Mass Index (BMI) was calculated using the Center for Disease Control and Prevention web site, BMI Calculator for Child and Teen.

Measurement of height was carried out using a standard physician's beam scales (Detecto) with height board attached, without shoes, heels together and the head in the Frankfort plane and measured to the nearest one-fourth inch. Body mass (weight) was measured to the nearest one-quarter pound using a pre-calibrated electronic scale and physician's beam scales. Waist circumference was measured at the level of the umbilicus to the nearest 0.1 centimeter with a non-stretch reinforced fiberglass tape (1.9 cm) with the subjects in a standing position at the end of gentle expiration, with feet together and arms hanging at their sides (World Health Organization Protocol). Measurement of waist circumference was made directly over the skin. The measurer was positioned by the side of the subject to read the tape.

BMI, waist circumference, family history, and presence of AN were selected as determinants of increased risk for diabetes. [6] [7] [8] BMI >85th percentile[9], waist circumference >74.7 for boys and >73.8 for girls [10], a reported family history of diabetes (parent, grandparent, or sibling), presence of AN. All criteria were given equal weight.

Subset of High Risk Students

From both groups a subset of 50 students was chosen who might be at increased risk for diabetes. For these students, blood was drawn before and after the intervention. The cost of lab testing (not prevalence of students at risk) was the limiting factor in how many students would comprise the subset.

Of the 50 chosen from each school, some consents were not obtained, some were absent on the day of collection, and some refused to participate. Blood was collected on 50 Lufkin students and 39 Livingston students.
Of those drawn, 4 Lufkin students and 3 Livingston students were excluded because data was missing on either the pre or the post collection date. Therefore the subset of high risk students for which lab data was obtained consisted of 46 Lufkin students and 36 Livingston students.

Lab tests included: fasting blood sugar, hemoglobin A1c, total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), triglycerides, alanine aminotransferase (ALT), aspartate aminotransferase (AST), and insulin levels.

All blood collections were done by the staff of Memorial Express Lab. All lab tests were run on an Ortho Vitros 5.1 machine at Lufkin Memorial Hospital in Lufkin except for the hemoglobin A1c which was run on a Diastat machine at Lufkin Memorial Hospital in San Augustine, and the insulin level which was run by Quest Laboratory.

The Lifestyle Intervention

A lifestyle education program was presented to the entire Lufkin 6th grade over a nine week period consisting of one class per week. The program incorporated The Power of Prevention, produced by The American Association of Clinical Endocrinologists (AACE) and elements from The Power of Choice, Helping Youth Make Healthy Eating and Fitness Decisions, developed by USDA Food and Nutrition Service and US Department of Health and Human Services FDA. The focus of the program was on nutrition and activity with emphasis on personal choices to improve health. Both resources focus on young adolescents.

All five classes were used from the AACE Power of Prevention Program and four classes were chosen from the USDA Power of Choice program. **Table 1** summarizes the learning objectives from each of these nine classes.

The lifestyle intervention program was inserted into the regular curriculum during band, choir, and physical education class times. The logistical challenge was to insert additional information into an existing curriculum so that all sixth-grade students would be included. During the nine weeks of the intervention, one day out of five each week of band, choir, and physical education, was substituted with the intervention curriculum. In this way, the impact to band, choir and physical education was minimized and students were not deprived of potential physical activity that they would normally get in these classes.

Educators from the Horace C. Polk Jr. Regional Diabetes center conducted lifestyle education classes for the band and choir while the regular physical education teachers conducted lifestyle education classes during their assigned class times.

In order to preserve the integrity of the intervention program and to insure consistency, it was decided to conduct two sessions to outline program objectives, explain program rationale, generate enthusiasm, and reinforce desired learning objectives. These sessions also provided an opportunity to discuss program logistics. The faculty was very supportive of the effort.

The lifestyle intervention program was initiated with a general assembly of all sixth graders and faculty. The objective was to generate enthusiasm and outline program objectives. All students were given arm bands labeled The Power of Choice. A slide presentation adapted from the AACE Power of Prevention Program emphasized physical activity and sound nutrition as a means of maintaining good health. The program included a brief introduction to goal setting; an explanation of the activity logs to be used; and an introduction to serving sizes. An emphasis was placed on everyone having the power to make healthy choices for themselves and reaping the benefit of good health. The opening assembly was also a media event with brief remarks made by the local Texas state representative, the city mayor, and two of the three doctors who helped design the study. The local television station and newspaper covered the event.

All Lufkin children were issued pedometers (provided at no cost by AACE) and assigned the task of recording steps every day and submitting weekly activity logs. The activity log included separate columns to record steps from their pedometers and duration in minutes of activity. The Livingston control group did not receive the education intervention or the pedometers.

Table 1. Learning Objectives from the Lifestyle Intervention Program

Class 1 (AACE)
Be introduced to the Presidential Active Lifestyle Award (PALA)
Physical Activity Pyramid
Demonstrate proper use of pedometer and activity log
Class 2 (AACE)
Be able to name the eight basic body systems
Be able to list one or more functions of each system
Be able to name some basic ways that the body systems work together
- The endocrine system works closely with the nervous system
- The diaphragm – a muscle – controls breathing, the respiratory system
- The skeletal system – bone marrow – produces blood cells for the circulatory system
- The circulatory system carries oxygen for the respiratory system

Class 3 (AACE)
Be able to determine correct serving sizes
Be able to identify healthy alternatives for some favorite foods
Be able to connect vitamin and mineral intake with good health and prevention of illness and disease
- Vitamin C helps the body resist infection
- Vitamin D helps us absorb calcium
- Zinc helps wound healing and enhances our immune system

Class 4 (AACE)
Be able to analyze nutritional information from food labels
- How many calories per serving?
- How much is a serving?
- List the nutrients in each serving, i.e. protein, fat, carbohydrate, sodium, etc.

Be able to design a healthy meal, snack or dessert
Class 5 (AACE)
Be able to list the recommended frequency of specific activities on the Physical Activity Pyramid
Demonstrate using the activity log daily activity of 60 minutes
Be able to verbalize the recommended level of activity
- 60 minutes activity every day
- 30 minutes activity every day if over the age of 18

Be able to list benefits of physical activity
- Reduces the risk of developing diabetes
- Helps maintain a healthy weight
- Reduces the risk of developing high blood pressure
- Reduces the risk of developing heart disease
- Raises your energy level

Class 6 (USDA)
Be able to identify values that affect food and lifestyle choices
Demonstrate goal setting steps to manage lifestyle decisions
Class 7 (USDA)
Be able to define a serving size contrasted with helpings. i.e. measured amounts of foods contrasted with unmeasured amounts
Be able to identify healthy choices from the food guide pyramid
Be able to connect a physical activity with a number of calories burned
Class 8 (USDA)
Be able to use nutrition facts labels on drinks to make better beverage choices
Be able to explain why sodas are not smart choices. i.e. more sugar and calories with less vitamins and minerals
Be able to verbalize real world opportunities to make better drink choices. i.e. Order milk with lunch instead of a soda
Class 9 (USDA)
Be able to determine the fat in a typical fast-food meal
Identify how to eat more fruits, vegetables, and low fat foods at fast-food restaurants
Connect frequent fast food choices with poor health outcomes, i.e. one fast food meal can exceed the day's recommended amount of fat, too many calories leads to being overweight.

The Parent Survey

A parent pre and post intervention survey was developed by the team and administered to address the secondary study question: Does the knowledge and perception of parents of children at increased risk for diabetes change when the children are enrolled in an education program? Survey questions attempted to measure parent knowledge and perception of lifestyle and diabetes risk. **Table 2** represents the parent survey.

Table 2 Parent Survey	Strongly Agree 5	Agree 4	Unsure 3	Disagree 2	Strongly Disagree 1
Improving my health helps to reduce my risk for getting diabetes.					
Eating healthy is too expensive.					
An active lifestyle means less TV or computer time.					
It is possible to eat out and still eat healthy.					
Being overweight may lead to having diabetes.					
Eating and exercising as a family or group can make a healthy lifestyle easier.					
Lifestyle changes cannot prevent diabetes.					
A healthy lifestyle includes good nutrition and daily activity.					
It is not necessary to exercise daily to have good health.					
A healthy diet consists of a balance between meat, dairy, grains, vegetables and fruits.					
There is no scientific connection between a healthy diet and good health.					
There are more healthy choices than non healthy when eating at fast food restaurants.					
Family decisions about food and activity do not affect our health.					
Exercise will help me maintain a good body weight and feel better.					
Some of the healthiest foods in the grocery store are the least expensive.					
Meat is more healthy than vegetables or fruits.					
Spending more time watching TV or computer is healthy.					
A healthy diet that includes at least 5 servings of fruits & vegetables per day helps you to feel better.					
Being a little overweight is healthy.					
It is not necessary to eat right and exercise to be healthy.					

RESULTS

Ethnicity

The ethnicity of the two groups was considerably different given their geographic proximity. The Lufkin group was 28% Black, 38% White, 33% Hispanic, and 1% Other. The Livingston group was 11% Black, 70% White, 16% Hispanic, and 3% Other. The small size and the disproportionate ethnic mix of the subsets of high risk students in each group rendered ethnic comparisons unreliable in this study.

Screening Data

Comparisons were made between the Lufkin experimental group and the Livingston control group by a simple average of anthropometric and lab data from each group. The percent difference represents the percent change of the group calculated thus: the difference between pre intervention and post intervention values divided by the pre intervention value. While some of these results were not found to be statistically significant, the practical implications are interesting.

The Lufkin group lost on average 0.86 centimeters (-1.1%) on waist circumference compared to the Livingston group who gained 0.23 centimeters (0.3%). Lufkin high risk students lost on average 2.27 centimeters (-2.4%) on waist circumference compared to Livingston high risk students who gained 0.20 centimeters (0.2%). **Chart 1**.

When comparing Body Mass Index (BMI) that factors for height and weight, the Lufkin group on average increased their BMI by 0.7% compared to the Livingston group whose BMI increased by 1.7%. The Lufkin high risk students average BMI increased 0.2% compared to the Livingston group whose BMI increased on average by 3.4%. **Chart 2**.

Chart 1.

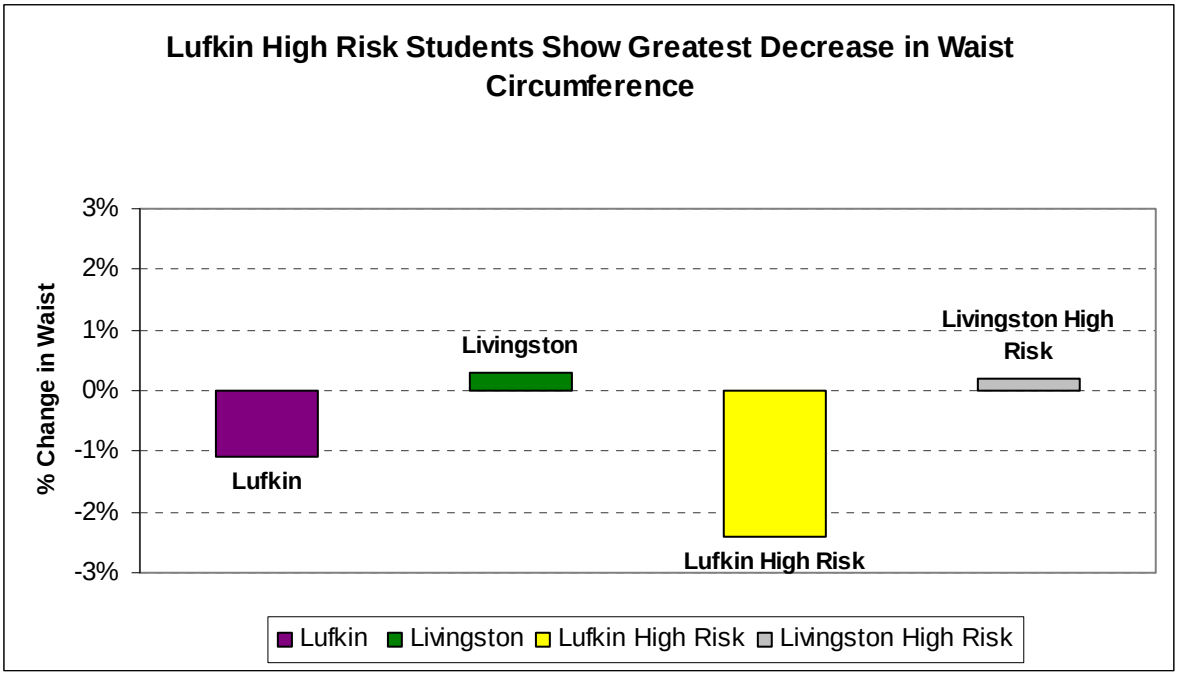
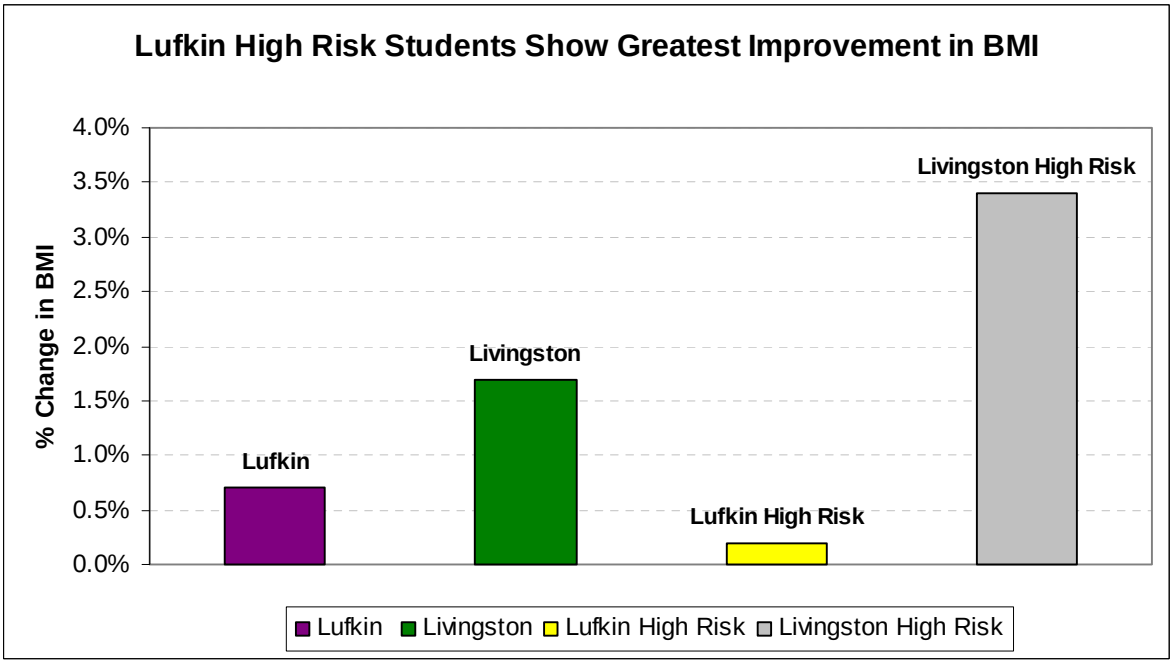


Chart 2.



Hemoglobin A1c is a measure of blood sugar control over a period of time (approximately 3 months). The Lufkin group increased by 3.1% compared to the Livingston group who increased by 6.9%. **Chart 3**.

Insulin levels can indicate that a person is at higher risk for developing diabetes. The Lufkin group lowered their insulin levels by 6 µIU/ml (26%). The Livingston group increased their insulin levels by 12 µIU/ml (109%). **Chart 4**.

Chart 3.

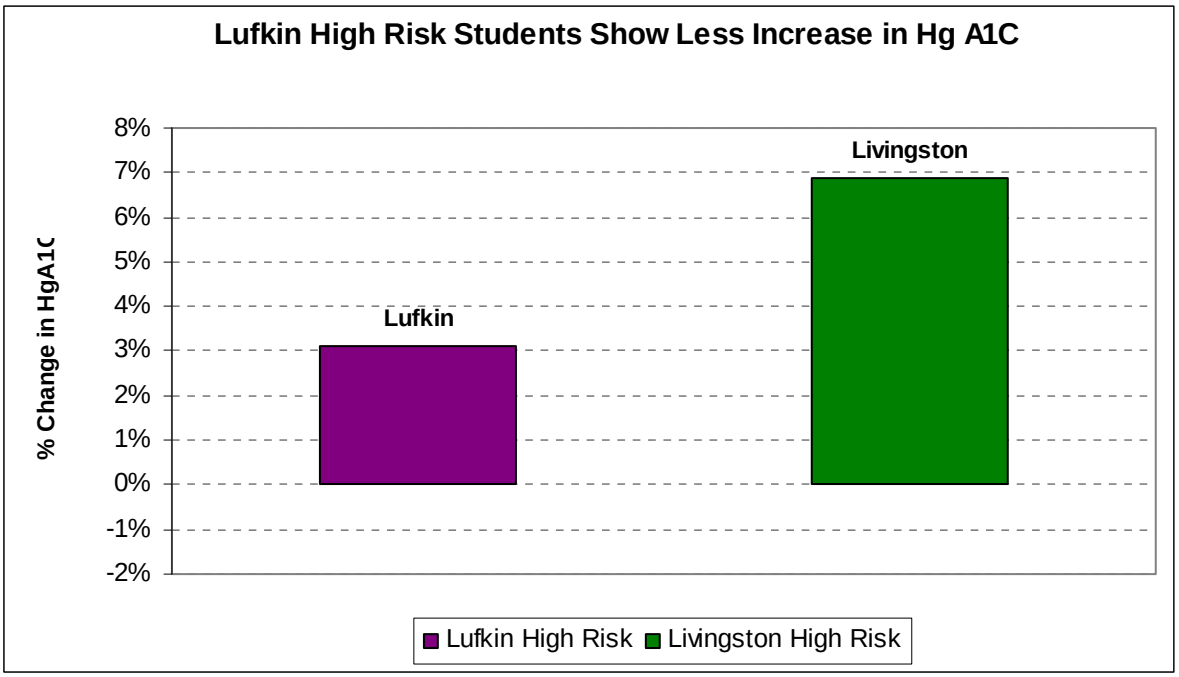
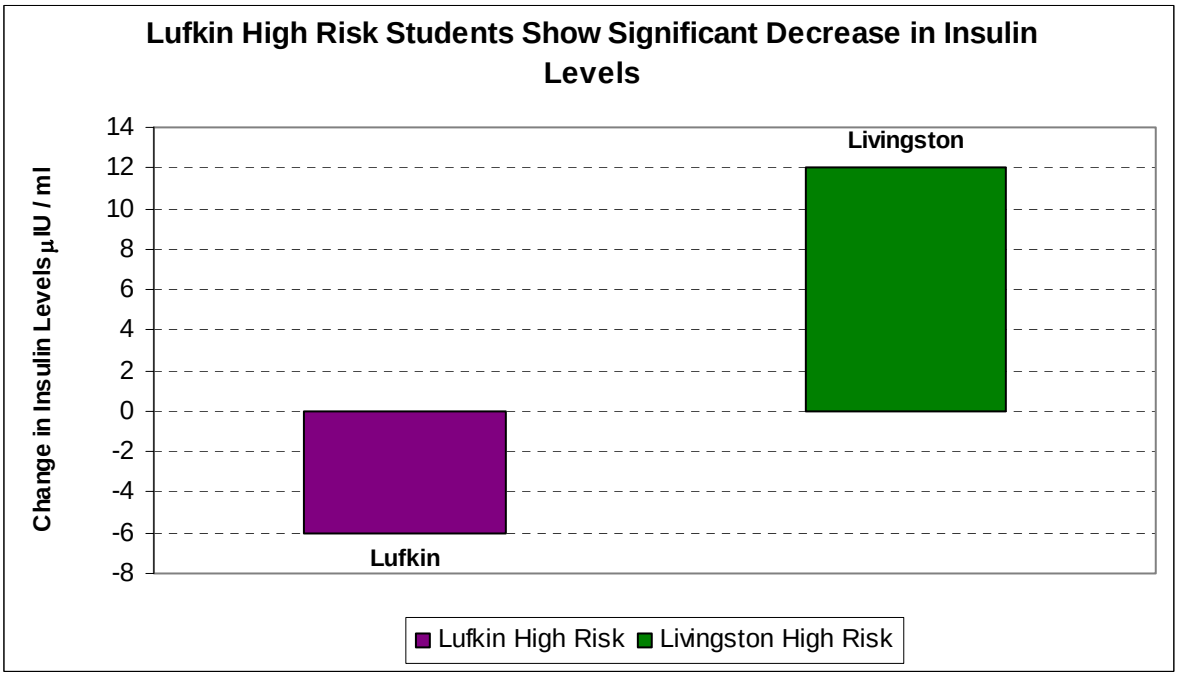


Chart 4.



A reduction in triglycerides might indicate better food choices. On average, the Lufkin group decreased their triglycerides by 15.1% compared to the Livingston group whose triglycerides increased by 15.3%. **Chart 5**.

An increase in HDL cholesterol might indicate an increase in activity. On average, the Lufkin group increased their HDL cholesterol by 8.7% compared to the Livingston group whose HDL cholesterol decreased by 7.5%. **Chart 6**.

Chart 5.

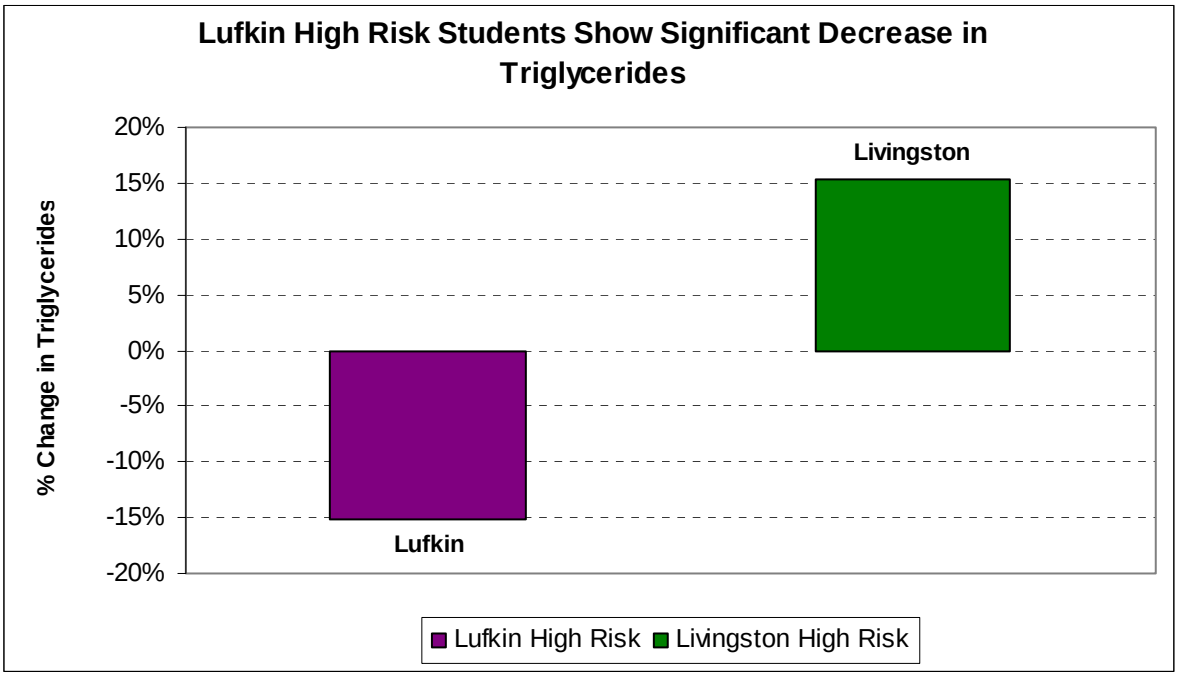
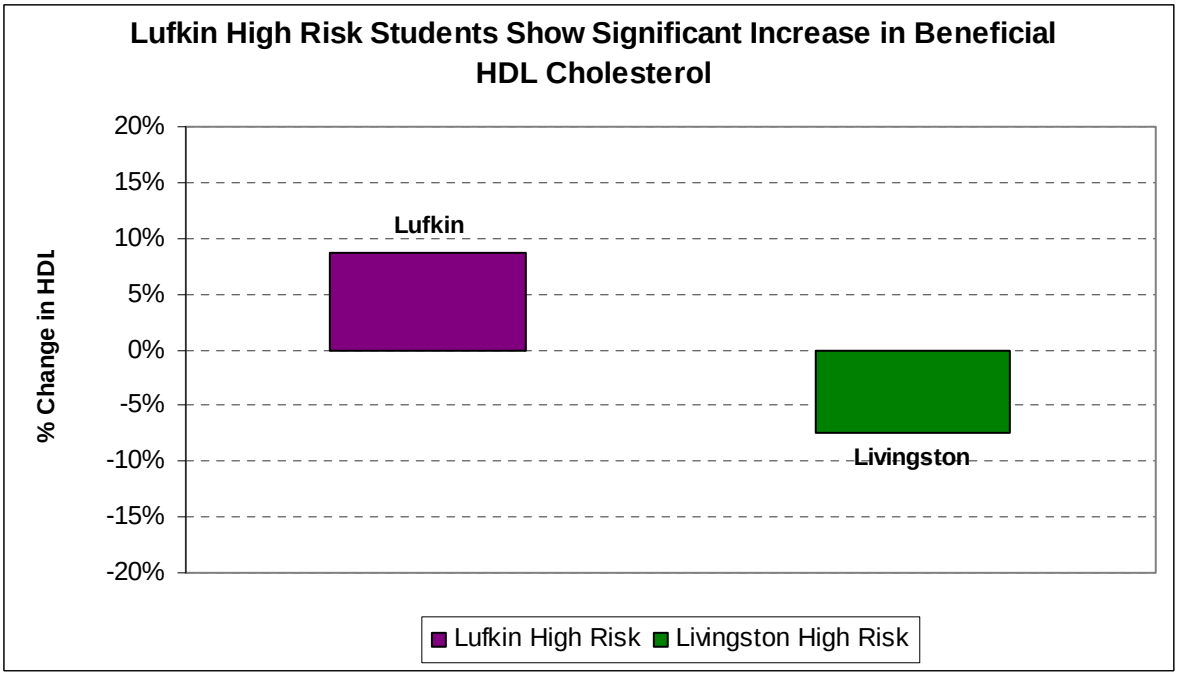


Chart 6.



Statistically Significant Findings
Initial analysis compared the experimental Lufkin group with the control Livingston group. The data was analyzed through a 2-way analysis of variance that compared post-test scores between schools, while controlling for pre-test values. Statistical analysis identified the following results:

Waist size decreased by 2 centimeters in the experimental group.
Fasting glucose decreased by 16 points in the experimental group.
Insulin levels decreased 7 points in the experimental group.
Triglycerides decreased 25 points in the experimental group.
HDL cholesterol increased by 8 points in the experimental group.
LDL cholesterol showed no change.
Total cholesterol increased by 5 points in the experimental group.
There was no statistically significant difference demonstrated in BMI or blood pressures.

The fact that HDL cholesterol increased in the Lufkin children suggests that they increased their activity level. The reduction in waist size would support this assumption. Reductions in fasting glucose, triglycerides and insulin levels suggest that the Lufkin children may have altered their food choices thus lowering their risk for obesity and diabetes. The fact that HDL cholesterol increased with no change in LDL cholesterol might indicate a reduced risk of heart disease.

A second statistical analysis was done looking for statistically significant change between the pre and post values of subjects within each group. The data was analyzed through a nonparametric Wilcoxon related-samples t-test that compared pre-test and post-test values of the two schools. It was not assumed that data are normally distributed. It was also not assumed that variances and the means are equal for pre and post values. This is not an ideal analysis, but it is reasonable given the limitations of the data, mainly unequal variances, means, and sample size for the pre and post values.

There was a significant difference ($P<=0.05$) within the Lufkin boys for height, weight, waist, FBS, HDL, triglycerides and insulin; within the girls height, weight, waist, BMI, HgA1c, HDL, AST and ALT were significant. For the Livingston boys, there was a significant difference in height, weight, waist, BMI, HgA1c, total cholesterol, HDL, LDL, ALT and insulin, for the girls, height, weight, BMI, FBS, HgA1c, total cholesterol, ALT and insulin. For the high-risk Lufkin boys, there was a significant difference in height, FBS, HDL, triglycerides and insulin, for the girls in height, weight, waist, HgA1c, HDL, AST and ALT. For the high-risk Livingston boys, there was significance in weight, waist, HgA1c, total cholesterol, HDL, LDL, ALT and insulin, for the girls weight, BMI, FBS, HgA1c, total cholesterol, ALT and insulin were significant. There was a significant difference in blood pressure for both Lufkin boys and girls for both systolic and diastolic. There was a significant difference in blood pressure for Livingston boys for systolic; for girls, both systolic and diastolic were significant. There was a significant difference in blood pressure for the high-risk boys and girls in both schools. These findings are summarized in **Table 3**.

Table 3

Livingston Boys	Sample Size	Sig. p <=0.05
PreHeight & PostHeight	122	0.015
PreWeight & PostWeight	122	0.000
PreWaist & PostWaist	122	0.731
PreBMI & PostBMI	122	0.000
PreFBS & PostFBS	not enough data to analyze	
PreHgA1c & PostHgA1c	15	0.000
TtlChol & PostChol	15	0.018
PreHDL & PostHDL	15	0.018
PreLDL & PostLDL	15	0.011
PreTrig & PostTrig	15	0.087
PreAST & PostAST	15	0.815
PreALT & PostALT	15	0.012
PreInsulin & PostInsulin	15	0.164

Livingston Girls	Sample Size	Sig. p <=0.05
PreHeight & PostHeight	124	0.000
PreWeight & PostWeight	124	0.000
PreWaist & PostWaist	124	0.363
PreBMI & PostBMI	124	0.003
PreFBS & PostFBS	21	0.012
PreHgA1c & PostHgA1c	21	0.000
TtlChol & PostChol	21	0.060
PreHDL & PostHDL	21	0.052
PreLDL & PostLDL	21	0.181
PreTrig & PostTrig	21	0.096
PreAST & PostAST	21	0.067
PreALT & PostALT	21	0.002
PreInsulin & PostInsulin	21	0.048

Lufkin Boys	Sample Size	Sig. p <=0.05
PreHeight & PostHeight	217	0.000
PreWeight & PostWeight	217	0.000
PreWaist & PostWaist	217	0.019
PreBMI & PostBMI	217	0.107
PreFBS & PostFBS	21	0.010
PreHgA1c & PostHgA1c	21	0.196
TtlChol & PostChol	21	1.000
PreHDL & PostHDL	21	0.001
PreLDL & PostLDL	21	0.763
PreTrig & PostTrig	21	0.196
PreAST & PostAST	21	0.035
PreALT & PostALT	21	0.329
PreInsulin & PostInsulin	21	0.033

Lufkin Girls	Sample Size	Sig. p <=0.05
PreHeight & PostHeight	249	0.000
PreWeight & PostWeight	249	0.000
PreWaist & PostWaist	249	0.000
PreBMI & PostBMI	249	0.019
PreFBS & PostFBS	25	0.472
PreHgA1c & PostHgA1c	25	0.031
TtlChol & PostChol	25	0.695
PreHDL & PostHDL	25	0.024
PreLDL & PostLDL	25	0.340
PreTrig & PostTrig	25	0.083
PreAST & PostAST	25	0.029
PreALT & PostALT	25	0.000
PreInsulin & PostInsulin	25	0.770

Self Reported Family History

49% of Lufkin students (271 of 559) reported family history of diabetes. 17% of Livingston students (53 of 306) reported family history of diabetes.

Incidence of Acanthosis Nigricans

22% of Lufkin students (102 of 467) had Acanthosis nigricans (AN) – a dark mark on the neck that may indicate insulin resistance. 9 – 12% of Livingston students (22 during the pre screen and 29 during the post screen of 246 students) had AN markings.

Self Reported Activity

Within 2 weeks, many of the students had lost or broken their pedometers. They were instructed to continue recording minutes of duration of their daily activities. While the quality of the self reported activity logs left much to be desired, it is believed that the assignment to log activities was productive and beneficial. For many students, the process of logging activities may have had the effect of increasing their level of activity.

The Parent Survey

Parents of the Lufkin group were surveyed at the beginning of the study and then again after the students were educated to measure parent knowledge and perception about healthy eating and activity as it relates to overall health. Some of the findings seem to indicate a change in perception after the intervention.

There is no scientific connection between a healthy diet and good health.
(Correct Answer: Untrue)

	Agree	Unsure	Disagree
PRE SURVEY	**10%**	**30%**	**57%**
POST SURVEY	**6%**	**25%**	**63%**

→ →

Responses seem to indicate movement toward the correct answer.

Some of the healthiest foods in the grocery store are the least expensive.
(Correct Answer: True)

	Agree	Unsure	Disagree
PRE SURVEY	**36%**	**28%**	**34%**
POST SURVEY	**46%**	**23%**	**32%**

← ←

Responses seem to indicate movement toward the correct answer.

There are more healthy choices than non healthy when eating at fast food restaurants.
(Correct Answer: Untrue)

	Agree	Unsure	Disagree
PRE SURVEY	**20%**	**14%**	**64%**
POST SURVEY	**20%**	**7%**	**68%**

→

Responses seem to indicate movement from "Unsure" to "Disagree". Perhaps those who eat at fast food restaurants remain unchanged.

All of the results from the pre and post parent surveys can be found in **Tables 4 and 5**. The questions are listed under the general topics that represent areas of knowledge and perception of the respondent. Also noted is the intent of the question.

Table 4

CLIP Parent Pre-Survey Summary

Number of surveys sent:	583
Number of surveys returned:	312
Survey return rate:	**54%**

PREVENTION

Intent: Identify a connection between lifestyle and diabetes	**Agree**	**Unsure**	**Disagree**
Improving my health helps to reduce my risk for getting diabetes.	**94%**	3%	1%
Lifestyle changes cannot prevent diabetes.	17%	22%	**59%**

Intent: Components of a healthy lifestyle

A healthy lifestyle includes good nutrition and daily activity.	**97%**	1%	1%
It is not necessary to eat right and exercise to be healthy.	5%	4%	**89%**

Intent: Role of exercise in good health

Exercise will help me maintain a good body weight and feel better.	**96%**	1%	1%
It is not necessary to exercise daily to have good health.	21%	11%	**65%**

Intent: Role of diet in good health

A healthy diet that includes at least 5 servings of fruits & vegetables per day helps you to feel better.	**82%**	12%	3%
There is no scienctific connection between a healthy diet and good health.	10%	30%	**57%**

BARRIERS TO HEALTHY LIVING

Intent: Can eating out be healthy?

It is possible to eat out and still eat healthy.	**73%**	12%	11%
There are more healthy choices than non healthy when eating at fast food restaurants.	20%	14%	**64%**

Intent: Is healthy eating affordable?

Some of the healthiest foods in the grocery store are the least expensive.	**36%**	28%	34%
Eating healthy is too expensive.	20%	10%	**66%**

SOCIAL/SUPPORT GROUP

Intent: Family support helps to make healthy lifestyles manageable.

Eating and exercising as a family or group can make a healthy lifestyle easier.	**94%**	4%	1%
Family decisions about food and activity do not affect our health.	14%	10%	**71%**

Intent: Role of TV and computer in an active lifestyle

An active lifestyle means less TV or computer time.	**83%**	4%	9%
Spending more time watching TV or computer is healthy.	4%	1%	**93%**

CULTURAL DEFINITION OF HEALTH

Intent: Cultural values affect food choices.

A healthy diet consists of a balance between meat, dairy, grains, vegetables and fruits.	**93%**	3%	1%
Meat is more healthy than vegetables or fruits.	4%	20%	**74%**

Intent: Cultural values about weight status affect healthy lifestyle.

Being overweight may lead to having diabetes.	**89%**	4%	2%
Being a little overweight is healthy.	6%	19%	**71%**

Table 5

CLIP Parent Post-Survey Summary

Number of surveys sent: 583
Number of surveys returned: 114
Survey return rate: **20%**

PREVENTION

Intent: Identify a connection between lifestyle and diabetes

	Agree	Unsure	Disagree
Improving my health helps to reduce my risk for getting diabetes.	**89%**	5%	2%
Lifestyle changes cannot prevent diabetes.	20%	14%	**61%**

Intent: Components of a healthy lifestyle

A healthy lifestyle includes good nutrition and daily activity.	**94%**	3%	1%
It is not necessary to eat right and exercise to be healthy.	5%	5%	**86%**

Intent: Role of exercise in good health

Exercise will help me maintain a good body weight and feel better.	**95%**	0%	4%
It is not necessary to exercise daily to have good health.	15%	14%	**71%**

Intent: Role of diet in good health

A healthy diet that includes at least 5 servings of fruits & vegetables per day helps you to feel better.	**79%**	15%	4%
There is no scienctific connection between a healthy diet and good health.	6%	25%	**63%**

BARRIERS TO HEALTHY LIVING

Intent: Can eating out be healthy?

It is possible to eat out and still eat healthy.	**75%**	12%	8%
There are more healthy choices than non healthy when eating at fast food restaurants.	20%	7%	**68%**

Intent: Is healthy eating affordable?

Some of the healthiest foods in the grocery store are the least expensive.	**46%**	23%	32%
Eating healthy is too expensive.	20%	7%	**67%**

SOCIAL/SUPPORT GROUP

Intent: Family support helps to make healthy lifestyles manageable.

Eating and exercising as a family or group can make a healthy lifestyle easier.	**92%**	3%	4%
Family decisions about food and activity do not affect our health.	8%	16%	**71%**

Intent: Role of TV and computer in an active lifestyle

An active lifestyle means less TV or computer time.	**84%**	5%	4%
Spending more time watching TV or computer is healthy.	4%	0%	**89%**

CULTURAL DEFINITION OF HEALTH

Intent: Cultural values affect food choices.

A healthy diet consists of a balance between meat, dairy, grains, vegetables and fruits.	**91%**	5%	1%
Meat is more healthy than vegetables or fruits.	8%	13%	**77%**

Intent: Cultural values about weight status affect healthy lifestyle.

Being overweight may lead to having diabetes.	**93%**	1%	3%
Being a little overweight is healthy.	6%	20%	**68%**

The Children's Survey

At the end of the nine week intervention, students were asked to complete a survey. Their comments serve as a source of subjective feedback on the impact of the program. Those comments in bold are of particular interest as they seem to suggest that learning objectives were transferred. The results are summarized in **Table 6**.

Table 6

Children's Lifestyle Intervention Program (CLIP)

Student Survey

Summary

Number of Lufkin Students 545

	Yes	No	Total	% Pos	Resp Rate
Did the classes help you to make better choices about food and activity?	**278**	**37**	315	**88%**	58%
Have you shared what you have learned about good nutrition and activity with family and/or friends?	**259**	**79**	338	**77%**	62%
With increased activity levels, most people notice that they have more energy. Have you noticed that you have more energy during the past nine weeks?	**271**	**55**	326	**83%**	60%
Do you think that your study habits have improved during the past nine weeks?	**243**	**78**	321	**76%**	59%
Do you think that you have felt healthier during the past nine weeks?	**275**	**53**	328	**84%**	60%

Did you get sick less often during the past nine weeks?	**209**	**114**	323	**65%**	59%
	1535	**416**	1951	**79%**	

What is the most important thing that you learned from this program?

about the calories & fats, eat healthy, eating fast food places are bad to eat every day, that your body sets how long you live, ***that activity can be fun****, portions, to be healthier, to learn how to eat right, what to choose & what is healthy,* ***don't eat so much fat****, how much fat was in the food I ate,* ***you should do less watching tv & computers & you should do more exercise, you need to stay active to live a better life, I learned portion control****, don't eat junk food too much, to eat less fat, about the stuff that goes in our bodies,* ***to check the calories and fats****, about calories and needing activity, how to stay away from fat & fast food, what to eat or what not to eat,* ***don't drink a lot of cokes, I learned that just because it tastes good doesn't mean it's healthy for you****, being healthy not being unhealthy, you have to watch what you eat & you need calcium,* ***making choices can change your life****, Nothing, getting fatter,* ***now I eat vegetables & love them****,*

Write one or two sentences describing how you have made better choices about food or increased activity during the past nine weeks.

I have more energy to run, ***I have started ordering grilled instead of fried*** *& I have also been more physically active, I have started making A's & B's,* ***I have started to ex-ercise more and do more activities.*** *I have made better decisions on my food choices,* ***I have lost a couple of inches, I have lost 4 pounds****, when I first started the session I have been able to make better choices,* ***I lost 5 lbs****, danced a lot, I think twice about what I eat, I do twiring and a lot of dancing &* ***I eat @ less fast food restaurants****, I've gone outside more,* ***I have moved more & I eat more fruits*** *I've ate less,* ***I chose to eat @ home more than going out to eat*** *&* ***I eat less food @ lunch****, Since I changed my eating habits I really never get sick, I have not eaten junk food that often, I go dancing and running the track,* ***I've been being more active than before so I slimmed some****, I have been eating less foods w/lot's of calories, I know how to control my sugar in take,* ***I've been better in science & I have been increasing energy day by day, I play more sports than video games, I will not eat so many french fries so much****, I eat protein then sugar,* ***I have eaten more vegetables than burgers & have done more exercise than watching TV, I have been drinking water instead of soda, started buying re-duced milk instead of whole milk****, I have done the same I have been doing, I* ***started telling mom to grill food instead of frying it****, whenever we have waffles we get whole-grain waffles*

DISCUSSION

When the two schools were chosen, it was not recognized that the ethnic mix would be so different. This effectively reduces the ability of one to make ethnic comparisons of the subset high risk children from this study. This difference in ethnic mix might explain the difference in reported family history of diabetes. 49% of Lufkin students reported family history of diabetes while 17% of Livingston students reported family history of diabetes.

Since the study was done on a limited budget, the cost of lab tests became a limiting factor on the size of the subsets. With larger subsets of at risk students, better comparisons could have been made between ethnic groups.

Several factors contributed to the success of this effort. The commitment from the hospital of materials and human resources and the generous support of a local philanthropist made the study possible. The superintendents and principals of the participating schools were enthusiastic and supportive. Without their commitment, the effort would have failed. And the guidance of the medical and hospital team insured that the study was relevant in design.

Media promotion also may have contributed to the successful results. The opening general assembly was enthusiastic and may have generated some motivation on the part of the children. While the parents were not significantly targeted in this study, newspaper coverage of the study may have indirectly influenced some parents.

While the pedometers were very popular with many students, their practical use in the study was minimal. However, the weekly assignment to turn in activity logs may have had the effect of increasing activity levels.

This study benefited from the talents of a variety of subject experts from different industries. Each was able to contribute in their area of expertise. For example, pediatricians and an endocrinologist guided the study design. Dietitians chose appropriate education materials. Public school teachers and principals facilitated incorporation of the intervention. School nurses coordinated the screenings. While team diversity was a strength of this pilot study, it can also pose logistical challenges that must be overcome by commitment and open communication. The common benefit of such an effort is the welfare of the children of the community.

CONCLUSIONS

This brief pilot study seems to reinforce the obvious. The growing issue of childhood obesity with its associated health problems can be addressed by teaching children at an early age to make healthy food choices and to choose an active lifestyle. These sixth graders were given health information based on science and encouraged in a fun format to track their activity. While it is important to teach the parents, there are natural motivations within the children themselves that can be harnessed to change behaviors and improve health status. No one wants to be unhealthy or would actively choose to live a shortened life. The intervention program was designed to connect lifestyle choices with overall health. This places the responsibility on the individual for one's own health status. This is not to deny the essential role of parents. It is merely to state that this program seems to have achieved modest success without significantly targeting parents.

The CLIP study brought together the expertise and resources of the public schools, the medical community, private interests and the healthcare industry in an effort to benefit the children of our community. In this, the study was a community success.

Recommendations

This study while focused on childhood diabetes raises the ongoing question of how to address the larger issue of childhood overweight/obesity. The broader question might be how to construct a community environment that offers wellness information and healthy choices for food and activity. Any model must involve schools. What would be the result if the model included most community entities that interface with children? Would it be possible to develop a community wellness agenda by educating day care owners, area fitness clubs, school food service directors, YMCA directors, WIC educators, local restaurants, and local retailers? Hospitals might play a coordinating role in building a community consortium committed to the wellness of its children. There are other wellness programs that have demonstrated successful results when hospitals partner with schools or community organizations. [11]

Hospitals employ dietitians, nurses, and physical therapists who are well adapted to community presentations on wellness. The coordinating facility might develop a series of presentations with the following agenda: Statistics on childhood overweight/obesity, statistics on childhood diabetes, appropriate fitness goals, sound nutrition, healthy grocery shopping, and an overall community wellness agenda. These presentations might include local statistics gathered on students by the local schools. With local statistics available, community targets might be established and incorporated into the presentations.

The success of this type of model will depend on the use of sound principles that have been proven over time. This would not be a forum for selling nutritional products, supplements, or gym memberships. Rather, the agenda would be information provided without endorsing specific retail interests.

This study highlights results accomplished by a partnership between healthcare and public schools. There already exist many resources and formal lifestyle programs [12] that are available to middle schools. These programs might be coordinated through the existing School Health Advisory Council (SHAC) structure with input from public school educators. Hospitals might serve as a community resource for the SHAC.

A specific recommendation might be to add waist circumference to the current screening of middle school children. While height and weight data and BMI are important measures, waist circumference has been shown to be an easy predictor of insulin resistance in adolescents. [13] In addition to identifying students at risk, screening results might be recorded and used to measure progress of lifestyle education programs.

With shrinking hospital reimbursements, it is appropriate to offer financial incentives to hospitals that will partner with schools and other community players to assist in setting up a community wellness model. The justification for this type of expenditure might be found in the old adage, "An ounce of prevention is worth a pound of cure."

Acknowledgements
Many hands came together to make this effort a success. We would like to acknowledge with sincere appreciation the following individuals and groups: Mr. Ray Polk whose financial support made this study possible; Congressman Jim McReynolds; Dr. Lance Sloan, Clinical Director of the study; Dr. Jeffrey Glass; Dr. Ghazala Khan; Mr. Roy Knight, Lufkin ISD Superintendent; Ms. Vickie Evans, Principal of Lufkin Middle School; Mr. Darrell Myers, Livingston ISD Superintendent; Ms. Ethel Ballenger, Coordinator of the Horace C. Polk Jr. Regional Diabetes Center; Ms. Deborah Brantley, Nurse Educator of the Horace C. Polk Jr. Regional Diabetes Center; Ms. Tiffany Blackwood, Clinical Dietitian; Ms. Lindsey Mott; Ms. Amy Varnado; Ms. Shanna English; Ms. Leah Jones; Ms. Melanie Simms; The Faculty and Staff of Lufkin Middle School; Mrs. Jan Durham and her team of LISD School Nurses; Ms. Janell Collier, Livingston School Nurse; Ms. Lesia Jones and the staff of Memorial Express Lab; Student Nurses from Angelina College; Dietetic Interns from Stephen F. Austin State University; The American College of Clinical Endocrinologists A.C.C.E.; The USDA Food and Nutrition Service and US Department of Health and Human Services FDA and The Texas Diabetes Council.

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